

Course Syllabus for PHYS680 — Introduction to Nanophysics

Course Information

Semester: Fall 2017

Credit hours: 3

Class time: Mondays and Wednesdays 10:00AM-11:15AM

Class room: La Tourette Hall 227

Textbooks: Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience, 2nd Edition (Recommended)
Edward L. Wolf, ISBN: 978-3-527-40651-7
Mesoscopic Electronics in Solid State Nanostructures
Thomas Heinzel, ISBN: 978-3-527-40638-8

Instructor Contact Information

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Teaching Philosophy

1. A teacher should be a good motivator.
2. A course's outcome should be judged by how much the students learned rather than how much the teacher taught.

Course Description

Characterization, fabrication, imaging, manipulation, and physical properties of nanostructures. Topics may include length scales, fabrication by top-down and bottom-up approaches, probing techniques, transport and optical properties, superconductivity and magnetism of nanostructures.

Prerequisites & Notes

PHYS 560 or PHYS 660 and PHYS 580 or PHYS 666, or consent of the department.

Course Goals and Objectives

1. Expose students to a major scientific research frontier.
2. Deepen students' understanding of solid-state physics via confinement effect and new phenomena in nanomaterials.
3. Stimulate students' interest in nanoresearch.

Student Learning Outcomes

Upon successful completion of this course the students will

1. be familiar with various nanofabrication, imaging, manipulation methods.
2. know major confinement effects and new phenomena in nanostructured materials and be able to use solid state physics to describe them.
3. be able to understand the physics in various nano-applications and nanodevices.

Instructional Methods

1) Lectures, 2) Class discussion, 3) Projects, and 4) Class presentations.

Course Assessment

Grading: Mid-term 30%; final exam 30 %; homework (30 %);
Attendance and class interaction 10%

Grading scale: A ($\geq 90\%$), A⁻ (85%~89%), B⁺ (80%~ 84%), B (75%~79%),
B⁻ (70%~74%), C⁺ (65%~69%), C (55%~64%), D (40%~54%).

Class schedule (tentative)

08/28: Introduction	08/30: Nanolithographies
09/04: No class (Labor Day)	09/06: Self-assembly
09/11: Nano-imaging	09/13: Solid state physics (A)
09/18: Solid state physics (B)	09/20: Nano-superconductors (A)
09/25: Nano-superconductors (B)	09/27: Nano-superconductors (C)
10/02: Nano-superconductors (D)	10/04: Nano-superconductors (E)
10/09: Nano-superconductors (F)	10/11: Nano-superconductors (G)
10/16: Project presentations	10/18: Midterm exam
10/23: Carbon nanotubes (A)	10/25: Carbon nanotubes (B)
10/30: Graphene (A)	11/01: Graphene (B)
11/06: 2DEG	11/08: Quantum wires (A)
11/13: Quantum dots (A)	11/15: Quantum dots (B)
11/20: Quantum dots (C)	11/22: No class (Thanksgiving break)
11/27: Nanophotonics	11/29: Nanophotonics
12/04: Nanomagnetism	12/06: QuBits
12/11: Final exam	

Accessibility Statement

Northern Illinois University is committed to providing an accessible educational environment in collaboration with the Disability Resource Center (DRC). Any student requiring an academic accommodation due to a disability should let his or her faculty member know as soon as possible. Students who need academic accommodations based on the impact of a disability will be encouraged to contact the DRC if they have not done so already. The DRC is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu.